

MR008L Toxicological Assessment Using Compound Specific Analyzer-Combustion Products (CSA-CP)
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3.2 Medical Requirements Overview

TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW

MRID# and Title:	MR008L Toxicological Assessment Using Compound Specific Analyzer-Combustion Products (CSA-CP)
Sponsor:	Medical Operations
Discipline:	Environmental Health
Category:	Medical Requirements
References:	ISS Medical Operations Requirements Document SSP 50260
Purpose/Objectives:	To provide a first warning by continuous monitoring of the ISS environment of a pyrolysis event, and then monitor decontamination of the atmosphere once an event has taken place. It is also present to guide donning and doffing of PPE. The Compound Specific Analyzer-Combustion Products (CSA-CP) provides real-time readings following a combustion event and subsequent clean-up efforts. The CSA-CP will also be used for continuous monitoring of carbon monoxide levels in the ISS.
Measurement Parameters:	Detection and concentration of carbon monoxide, hydrogen chloride, hydrogen cyanide and oxygen.
Deliverables:	Real-time assessment of crew exposure to specific noxious combustion by-products.
Flight Duration:	≥30 days
Number of Flights:	Every ISS Expedition
Number and Type of Crewmembers Required:	1 crewmember to act as operator
Other Flight Characteristics:	N/A

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3.3 Preflight Training

TABLE 3.3: PREFLIGHT TRAINING

Preflight Training Activity	Description:	Training/Familiarization will be covered under the following Environmental Health System (EHS) documents and lessons: EHS Toxicological Operations			
	Schedule:	Duration:	Schedule:	Flexibility:	Personnel Required:
		EHS Toxicological Operations: Experienced CM 30 min Inexperienced CM 60 min	L-12 months	N/A	Crewmembers/Instructors
Ground Support Requirements Hardware/Software	Preflight Hardware:	Preflight Software:		Test Location:	
	CSA-CP Accessories Kit CSA-CP Resupply Kit CSA-CP Transport Kit CSA Cal Adapter Portable Gas Delivery S system Medical Equipment Computer	CSA-CP Software on MEC		U.S	
Training Facilities	Minimum Room Dimensions:	Number of Electrical Outlets:	Temperature Requirements:	Special Lighting:	
	8' X 10'	1 (One)	Ambient	N/A	
	Hot or Cold Running Water:	Privacy Requirements:	Other:		
	N/A	N/A	1 table and 6 chairs		
Constraints/Special Requirements:	None				
Launch Delay Requirements:	Refresher training will be available upon crewmember request.				
Notes:	<ul style="list-style-type: none">Experienced CM – had training within the last 1½ yrs.EHS Toxicology Operations includes training for GSC, CSA-CP, FMK, CDMK, and SSAS if flown.				

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3.4 Preflight Activities – See Launch Delay Requirements below

TABLE 3.4: PREFLIGHT ACTIVITIES – See Launch Delay Requirements below

Preflight Activity	No Preflight Activity
Launch Delay Requirements:	For launch delay of >30 days (scrub turnaround), it will be necessary to refurbish the CSA-CP Kits with fresh CSA-CPs.
Notes:	None
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):
	N/A

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In-Flight Activities

TABLE 3.5.1: In-Flight Activities

Table 3.5.1a CSA-CP Nominal Ops

In-Flight Activity	Description:	CSA-CP Nominal Ops: During nominal operations, one (1) CSA-CP will be deployed and operated continuously. This CSA-CP will be deployed per crew discretion. This unit may be moved from one location to another at the discretion of the crewmembers with guidance from the Med Ops group. The three backup CSA-CPs remain in a fixed location also at crew discretion. All crewmembers will know exactly where the back-up units are located in case of an off-nominal event (i.e., fire).		
	Schedule:	Duration	Schedule	Personnel Required
		5 min - unstow	Continuous	1 Crewmember
		5 min – activate followed by continuous deployment 5 min stow (if necessary)		Unattended during continuous deployment
Procedures:	Procedures can be found in the Systems Operations Data File (SODF) Med Ops book: CSA-CP Operations for CSA-CP monitoring			
Constraints / Special Requirements:	<ul style="list-style-type: none">One CSA-CP will always be deployed.CSA-CP deployed location should not be:<ul style="list-style-type: none">closer than 4 feet from any conditioned air discharge duct/register.located in a stagnant air flow area such as an alcove-like region.deployed behind a stowage racklocated in close proximity to other equipment that might obstruct airflow across instrument.			
Photo/TV Requirements:	None.			
Cold Stowage Requirements:	N/A			
Mission Extension Requirements:	The CSA-CPs must be resupplied based on the calibration interval of the sensors.			
Notes:	<ul style="list-style-type: none">Location of CSA-CP: The unit may be moved from one location to another at the discretion of the crewmembers with guidance from the Med Ops group.No data download is required during nominal ops.If sensor exceeds threshold concentration, a local audio & visual alarm will occur.			
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):			

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	<p>Nominal: The crew calls down CSA-CP readings periodically to the MCC. These readings are distributed to interested parties by the BME.</p> <p>Contingency: Contingency data may be verbally communicated to MCC or downloaded from the CSA-CP and downlinked to ground. Air quality issues will be worked immediately by the Toxicology Section. If warranted, contingency reporting will be included in the overall air quality assessment report provided by the Toxicology Section.</p>
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Table 3.5.1: In-Flight Activities (cont'd)

Table 3.5.1b CSA-CP Activation & Checkout

In-Flight Activity	Description:	CSA-CP Activation & Checkout:		
		<ul style="list-style-type: none"> Deploy 2-4 newly resupplied CSA-CPs after the battery packs are replaced and zero calibrated. Periodic sensor readings are taken to monitor biased sensor levels until they have reached nominal levels. 		
	Schedule:	Duration	Schedule	Personnel Required
		50 min. 5 min per data measurement	Once every 3-5 months (planned), but may be extended upon post-flight analysis of units. Data measurements 6-8 days following resupply may be needed to monitor off-gassing of new units.	1 ECLSS CM
Procedures:	Procedures can be found in the Systems Operations Data File (SODF) Med Ops book: CSA-CP Activation and Checkout, CSA-CP Activation and Checkout with Resupply Kit			
Constraints / Special Requirements:	Resupply must be performed within 1 week after hardware arrival			
Photo/TV Requirements:	None			
Cold Stowage Requirements:	N/A			
Notes:	The 2-4 CSA-CP units being replaced onboard the ISS will be returned to the JSC Toxicologist for postflight evaluation.			
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):			
	N/A			

Table 3.5.1c CSA-CP Unscheduled Battery Changeout – As Needed

In-Flight Activity	Description:	CSA-CP Unscheduled Battery Changeout: The battery pack is replaced in the unit aside from the nominal monthly maintenance.		
		Duration	Schedule	Personnel Required

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Schedule:	<u>20 min total crew time:</u> 10 min. unstow/stow 10 min. battery changeout	As needed, when battery low indication beeps are annunciated from the CSA-CP or Battery Low indicator is displayed	1 ECLSS CM
Procedures:	Procedures can be found in the Systems Operations Data File (SODF) Med Ops book: CSA-CP Battery Changeout		
Constraints / Special Requirements:	Notify MCC-H when the battery changeout is completed.		
Photo/TV Requirements:	None		
Cold Stowage Requirements:	N/A		
Notes:	Battery is changed out with Maintenance task		
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):		
	N/A		

Table 3.5.1: In-Flight Activities (cont'd)

Table 3.5.1d CSA-CP Sampling Pump Battery Changeout - As Needed

In-Flight Activity	Description:	CSA-CP Sampling Pump Battery Changeout: Replace the battery pack within the Sampling Pump		
	Schedule:	Duration	Schedule	Personnel Required
	<u>20 min total crew time:</u> 10 min. unstow/stow 10 min. changeout		As needed, when audible beep from pump sounds every 30 seconds.	1 ECLSS CM
Procedures:	Procedures can be found in the Systems Operations Data File (SODF) Joint Ops book: CSA-CP Sampling Pump Battery Changeout			
Constraints / Special Requirements:	Notify MCC-H when the battery changeout is completed.			
Photo/TV Requirements:	None			
Cold Stowage Requirements:	N/A			
Notes:	None			
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):			
	N/A			

Table 3.5.1e CSA-CP Sampling Pump Filter Changeout – As Needed

In-Flight Activity	Description:	CSA-CP Sampling Pump Filter Changeout: Replace the filter on the Sampling Pump		
		Duration	Schedule	Personnel Required

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Schedule:	<u>15 min total crew time:</u> 10 min. unstow/stow 5 min. changeout	As needed, when pump goes into low flow alarm mode	1 ECLSS CM
Procedures:	Procedures can be found in the Systems Operations Data File (SODF) Joint Ops book: CSA-CP Sampling Pump Filter Changeout		
Constraints / Special Requirements:	None		
Photo/TV Requirements:	None		
Cold Stowage Requirements:	N/A		
Notes:	None		
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):		
	N/A		

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Table 3.5.1: In-Flight Activities (cont'd)

Table 3.5.1f CSA-CP Zero Calibration –As needed

In-Flight Activity	Description:	CSA-CP Zero Calibration: Units are zero-calibrated and values are compared		
	Schedule:	Duration	Schedule	Personnel Required
		20 min total crew time: 10 min. unstow/stow, 10 min. rezero and compare 2 units	As needed to correct sensor drift	1 ECLSS CM
Procedures:	Procedures can be found in the Systems Operations Data File (SODF) Joint Ops book: CSA-CP Zero Calibration of Units and Comparison of Values			
Constraints / Special Requirements:	None			
Photo/TV Requirements:	None			
Cold Stowage Requirements:	N/A			
Notes:	Units are zero calibrated with Monthly Maintenance task.			
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):			
	N/A			

Table 3.5.1g CSA-CP Data Download – Contingency

In-Flight Activity	Description:	CSA-CP Data download: Data stored in the datalogger is downloaded to the MEC		
	Schedule:	Duration	Schedule	Personnel Required
		30 min	Contingency Only	1 Operator
Procedures:	Procedures can be found in the Systems Operations Data File (SODF) Joint Ops book: CSA-CP Data Download			
Constraints / Special Requirements:	None			
Photo/TV Requirements:	None			
Cold Stowage Requirements:	N/A			
Notes:	None			
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):			
	N/A			

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Table 3.5.1h CSA-CP Data Logger Activation/Deactivation - Contingency

In-Flight Activity	Description:	CSA-CP Data Logger Activation/Deactivation: Turns the data logger on or off.		
	Schedule:	Duration	Schedule	Personnel Required
		5 min	Contingency Only	1 ECLSS CM
Procedures:	Procedures can be found in the Systems Operations Data File (SODF) Joint Ops book: CSA-CP Data Logger Activation/Deactivation			
Constraints / Special Requirements:	Notify MCC-H in the event of a contingency If contingency, CSA-CP download should occur immediately after this activity.			
Photo/TV Requirements:	None			
Cold Stowage Requirements:	N/A			
Notes:	Data are downloaded to MCC in contingency situations.			
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):			
		Evaluation of CSA-CP data following a contingency incident, e.g. fire, will be worked real-time by the Toxicology Section. A preliminary assessment will be provided as soon as possible, typically within an hour, after receipt of all pertinent information.		

Table 3.5.1i Contingency Sampling using CSA-CP

In-Flight Activity	Description:	Contingency Sampling using CSA-CP <ul style="list-style-type: none"> Backup unit mated with sampling pump and probe Activate data logger 		
	Schedule:	Duration	Schedule	Personnel Required
		As Needed: 10 min unstow, assemble, activate 3 min/sample (as needed during sampling time duration) 10 min deactivate, disassemble, stow	Contingency only	1 ECLSS CM
Procedures:	Procedures can be found in the Systems Operations Data File (SODF) Med Ops book: CSA-CP Active Sampling with Probe and Data Logging			
Constraints / Special Requirements:	Sampling may be required when difficulty in breathing, irritation of airways, headache, confusion and at discretion of crewmember or Flight Surgeon			
Photo/TV Requirements:	Photo documentation is required during contingency situations.			
Cold Stowage Requirements:	N/A			
Mission Extension Requirements:	None			

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Notes:	Data are downloaded to MCC in contingency situations.
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):
	Evaluation of CSA-CP data following a contingency incident, e.g. fire, will be worked real-time by the Toxicology Section. A preliminary assessment will be provided as soon as possible, typically within an hour, after receipt of all pertinent information.

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Table 3.5.1: In-Flight Activities (cont'd)

Table 3.5.1j CSA-CP Alarm/Autolog Setpoint Change – Contingency

In-Flight Activity	Description:	CSA-CP Alarm/Autolog Setpoint Change: Sets the instantaneous alarm thresholds (setpoints)		
	Schedule:	Duration	Schedule	Personnel Required
		20 min	Contingency Only	1 ECLSS CM
Procedures:	Procedures can be found in the Systems Operations Data File (SODF) Joint Ops book: CSA-CP Alarm/Autolog Setpoint Change			
Constraints / Special Requirements:	Notify MCC-H prior to changing any alarm/autolog setpoint.			
Photo/TV Requirements:	None			
Cold Stowage Requirements:	N/A			
Notes:	N/A			
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):			
	N/A			

Table 3.5.1k Post Fire Analysis using CSA-CP – Contingency

In-Flight Activity	Description:	Post Fire Analysis using CSA-CP: <ul style="list-style-type: none"> • Monitor air quality using both CSA-CP units • Download Data to MEC 		
	Schedule:	Duration	Schedule	Personnel Required
	As needed: 15 min. unstow, activate, and deploy backup unit 5 min. retrieve and deploy prime unit 3 min/sample (as needed sampling time duration) 5 min. deactivate and stow backup unit 30 min. data download to MEC		Contingency only	1 ECLSS CM
Procedures:	Procedures can be found in the Systems Operations Data File (SODF) Med Ops book: Post Fire Air Analysis			
Constraints / Special Requirements:	Sampling may be required when difficulty in breathing, irritation of airways, headache, confusion and at discretion of crewmember or Flight Surgeon. For CO > 50ppm an additional measurement is required using the CO Draeger Tube.			
Photo/TV Requirements:	Photo(s) showing deployment location(s) during contingency operations is (are) required.			
Cold Stowage Requirements:	N/A			
Mission Extension Requirements:	None			
Notes:	Data are downloaded to MCC-H in contingency situations.			

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Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):
	Evaluation of CSA-CP data following a contingency incident, e.g. fire, will be worked real-time by the Toxicology Section. A preliminary assessment will be provided as soon as possible, typically within an hour, after receipt of all pertinent information.

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TABLE 3.5.2: IN-FLIGHT HARDWARE

Hardware/Software Name	P/N
Compound Specific Analyzer-Combustion Products Accessories Kit (Specific quantities will be found in the current manifest)	SJG46120021-xxx
Compound Specific Analyzer-Combustion Products Resupply Kit	SJG46120020 -xxx
Compound Specific Analyzer - Combustion Products Transport Kit	SJG46120019-xxx
CSA Cal Adapter	SEG33120473-xxx
Portable Gas Delivery System	SEG46121543-xxx
Medical Equipment Computer (MEC)	SEG46116031-xxx
CSA-CP Software	N/A

3.5 Postflight Activities – No Postflight Activities

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3.6 Summary Schedule

TABLE 3.7: SUMMARY SCHEDULE

ACTIVITY	DURATION	SCHEDULE	PERSONNEL REQUIRED	CONSTRAINTS
Preflight Training				
EHS Toxicology Operations: Experienced CM Inexperienced CM	30 min 60 min	L-12 months	Crewmembers/ Instructors	None
Preflight: N/A				
In-Flight				
CSA-CP Nominal Ops	5 min - unstow 5 min – activate followed by continuous deployment 5 min stow (if necessary)	Continuous Monitoring	CSA-CP is unattended	- One CSA-CP will always be deployed; others will be stowed. - CSA-CP deployed location should not be located in close proximity to other equipment that might obstruct airflow across instrument.
CSA-CP Activation & Checkout	50 min. 5 min per data measurement	Once every 3-5 months (planned), but may be extended upon postflight analysis of units. Data measurements 6-8 days following resupply may be needed to monitor off-gassing of new units	1 ECLSS CM	Activation & Checkout to be performed within 1 week after hardware arrival
CSA-CP Unscheduled Battery Changeout	20 min	As needed	1 ECLSS CM	Notify MCC-H when the battery changeout is completed
CSA-CP Sampling Pump Battery Changeout	20 min	As needed	1 ECLSS CM	Notify MCC-H when the battery changeout is completed.
CSA-CP Sampling Pump Filter Changeout	15 min	As needed	1 ECLSS CM	None
CSA-CP Zero Calibration	20 min	As needed	1 ECLSS CM	None
CSA-CP Data Download - Contingency	30 min	Contingency only	1 operator	None

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CSA-CP Data Logger Activation/Deactivation - Contingency	5 min	Contingency only	1 ECLSS CM	Notify MCC-H in the event of a contingency If contingency, CSA-CP download should occur immediately after this activity
Contingency Sampling using CSA-CP	10 min – Unstow, Assemble, Activate 3 min/sample 10 min – Deactivate, Disassemble, Stow	Contingency only	1 ECLSS CM	Photo in contingency situation Sampling may be required when difficulty in breathing, irritation of airways, headache, confusion and at discretion of crewmember or Flight Surgeon.
CSA-CP Alarm/Autolog setpoint Change - Contingency	20 min	Contingency only	1 ECLSS CM	Notify MCC-H prior to changing any alarm/autolog setpoint
Post fire Analysis using CSA-CP - Contingency	25 min – Unstow/Stow 3 min/sample 30 min data download	Contingency only	1 ECLSS CM	Photo in contingency situation Sampling may be required when difficulty in breathing, irritation of airways, headache, confusion and at discretion of crewmember or Flight Surgeon. For CO> 50 ppm, an additional measurement is required using the CO Draeger Tube.
Wheels-Stop: N/A				
Postflight: N/A				
Postflight Debrief:				
Crew Debrief	15 min.	~R+30 days	Crewmembers & Toxicology Team	Included as part of the overall Med Ops debrief.